Modeling the Impact of Crime On African American Women's Physical Activity and Obesity in Washington, D.C.

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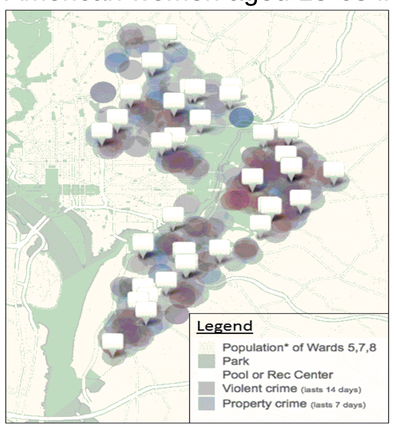
BACKGROUND

- Neighborhood crime could prevent individuals from going to gyms, parks, or recreation areas.
- Decision makers likely want to know the potential impact of crime on leisure-time physical activity (LTPA) and obesity.
- The limited data on the relationship between neighborhood crime, physical activity and obesity have shown mixed results.

OBJECTIVE

- To quantify the impact of crime on physical activity location accessibility, LTPA and obesity among African American women.

METHODS

- We developed a geospatially explicit, agent-based model representing populations in resource-limited Washington DC communities (Wards 5, 7, and 8)
- The model included virtual representations of households, PA and crime locations, and African American women aged 18-65 in these D.C. wards.
- 

  We calculated crime's impact on LTPA based on:
  - **Duration** (amount of time agent impacted by crime, days)
  - **Effect** (reduction in probability of LTPA in area, 0-100%)
  - **Radius** (radial distance of impact from crime location, 0.1-1 mile)
- Each agent had a baseline propensity to exercise, which includes individual, social, and environmental factors that serve as barriers or facilitators of daily exercise (i.e. cost, time commitments)..

RESULTS

Figure 1: Diagram of Agent Based Model

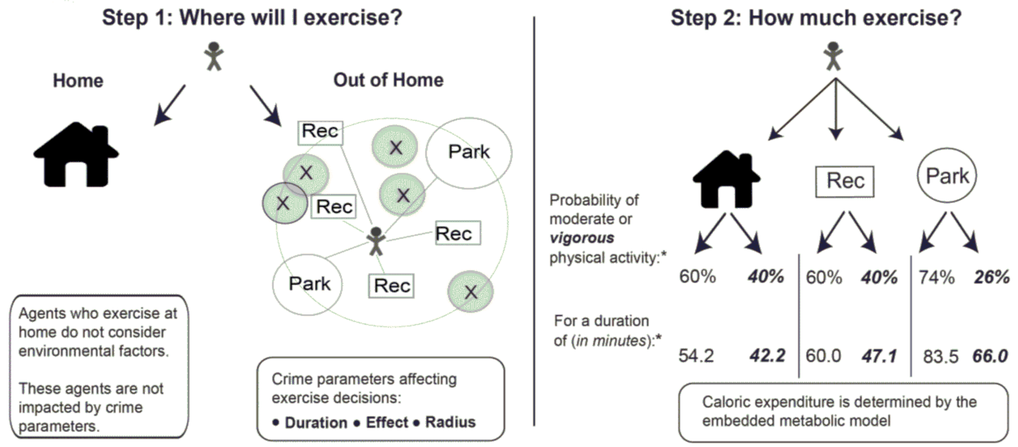


Figure 2: Daily Exerciser Percentage by Percentage of Accessible PA Locations

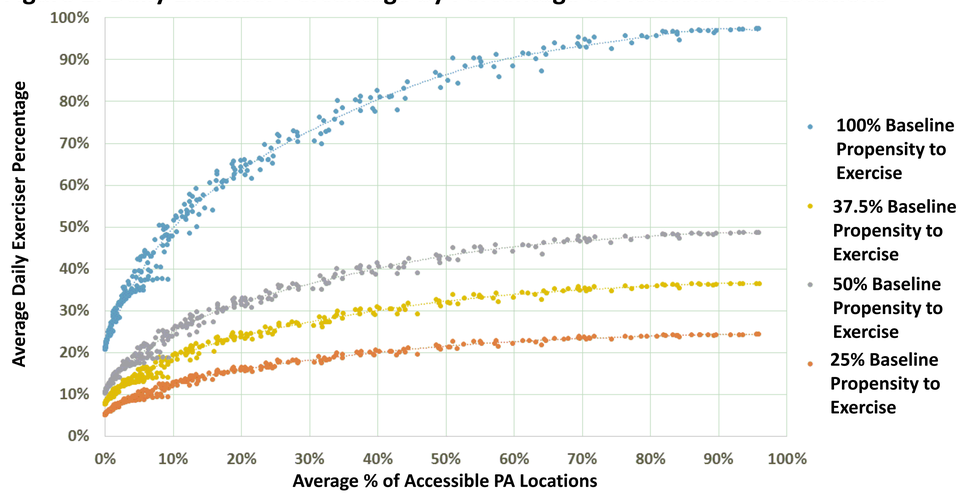


Figure 3A: Change in Overweight/Obesity

Baseline Probability to Exercise	Percent of Accessible Physical Activity Locations: 10%	50%	90%
100%	-6.84%	-18.36%	-22.58%
50%	-0.72%	-4.46%	-5.87%
37.50%	0.63%	-2.35%	-3.42%
25%	1.92%	-0.05%	-0.69%

Figure 3B: Change in Obesity

Baseline Probability to Exercise	Percent of Accessible Physical Activity Locations: 10%	50%	90%
100%	-9.04%	-20.11%	-24.38%
50%	-0.77%	-6.70%	-9.13%
37.5%	1.05%	-2.91%	-4.46%
25%	2.94%	0.25%	-0.79%

SUMMARY

- At the baseline exercise propensity, when 90% LTPA locations became accessible due to crime reductions, 24.2% women engaged in LTPA on a given day with a 0.79% reduction on obesity.
- When baseline propensity increased to 50% and crime reductions led to 90% LTPA location accessibility, 48.4% women exercised per day and obesity prevalence decreased by 9.1%.
- When isolating crime reduction's impact (at 100% baseline exercise propensity), making 90% LTPA location accessibility with crime reduction led to 96.9% of women exercising daily and 24% obesity reduction.

CONCLUSIONS AND IMPLICATIONS

- Our study focused on how crime's spatial nature can impact women's ability and willingness to access LTPA locations in an affected area.
- As baseline exercise propensity increases, reductions of crime and subsequent increases in LTPA location accessibility have larger impact on LTPA participation and obesity.
- Our findings suggest policies aimed at reducing obesity by increasing LTPA should take a multi-level approach that target individual-level and environmental barriers, including crime.
- Efforts targeting crime through urban renewal and policies to improve perceived safety in resource-limited urban communities may be particularly effective at improving cardiometabolic health in at-risk populations.

ACKNOWLEDGEMENTS

The GOPC is funded by the NICHD and OBSSR at NIH and AHRQ. This project was also funded by contract HHSN268201600067P between the GOPC and Powell-Wiley Laboratory. The Powell-Wiley Laboratory is funded by the Division of Intramural Research of the National Heart, Lung, and Blood Institute.